

Work Order ID 83642

83642

Page 1

April-20-12 2:53:18 PM

Item ID: D350-748-241TRN

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Turning Detail

Stop ***NS2***

Start Date: 20/04/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 04/05/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: MCS Date: 12/04/20

Tooling:

Date:

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
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D350-748-241	F
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100

0.00

100

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA647
2-Turn first side as per Folio FA647
3- File transition lines smooth.
FOLIO REV: _____
DWG REV: _____

KC 12-4-24

110

0.00

110

QC1- Inspect dimensions to dimension sheet

QC

Memo

0.00

Quality Control

KC 12-4-24

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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NOTE: Date & initial all entries

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Start Date: 20/04/2012 Start Qty: 1.00

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Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start ***NR1***
Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120	MORI SEIKI CNC LATHE LARGE	0.00							
120									
Mori Seiki	Memo	0.00							
Mori Seiki CNC Lathe Large	1-Turn second side as per Folio FA647 2- File transition lines smooth. 3-Scribe part # as per Dwg D350-748-241 FOLIO REV: _____ DWG REV: _____								
130	QC1- Inspect dimensions to dimension sheet	0.00							
130									
QC	Memo	0.00							
Quality Control									
140	QC8- Inspect parts - second check	0.00							
140									
QC	Memo	0.00							
Quality Control									

KC 12-4-24

KC 12-4-24

12-4-24

W/O:		WORK ORDER CHANGES					
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Accept

N9000040100

Setup Start *NS1*

Revision ID:

Item Name: Crosstube Turning Detail

Stop *NS2*

Start Date: 20/04/2012 Start Qty: 1.00 *1*

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Required Date: 04/05/2012 Req'd Qty: 1.00 *1*

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Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start *NR1*

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150

0.00

150

Large Fab

Crosstubes

Memo

0.00

Crosstubes

Grind machining marks.

RM
12-4-25

160

Outsource process - Heat Treat

0.00

160

Outsource

Memo

0.00

Outsource process - Heat Treat

Issue P/O: 16899
Heat Treat to min 180 KSI As per Dwg D350-748-241
Sand Blast tube after Heat Treat
Possible Supplier: Vac Aero
Ensure Certificate of Conformity is attached

12-05-3

170

Receive & Inspect for Damage & Mat'l Certs

0.00

170

Packaging

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

Perkins

W/O:		WORK ORDER CHANGES					
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NOTE: Date & initial all entries

Picklist Print

April-20-12 2:53:22 PM

Page 1

Work Order ID: 83642

83642

Parent Item: D350-748-241TRN

D350-748-241TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 20/04/2012

Required Date: 04/05/2012

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec
 IPP Rev B Removed polish 08.04.02 EC verified by : DD
 IPP Rev C Removed LPS-3 08.06.23 Ec verified by: DD IPP Rev D
 11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6015-125		Manufactured	No			120	Each	42.0000	1	1			

D6015-125

Crosstube Material

**

Use D6018-125

Location

Loc Qty

Loc Code

HALL

42

61380

4

72511

38

32913

1 MFM.L 12/04/22

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	83672
Description: Crosstube Assembly (AS350/355 High Aft)		Part Number:	D350-748-241
Inspection Dwg: D350-748-241 Rev: F		Page 1 of 1	

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.242	/			
	2.180	+0.005/-0.000	2.184	/			
	2.180	+0.005/-0.000	2.185	/			
	2.208	+0.005/-0.000	2.013	/			
	2.234	+0.005/-0.000	2.239	/			
	2.253	+0.005/-0.000	2.258	/			
	2.272	+0.005/-0.000	2.277	/			
	2.299	+0.005/-0.000	2.299	/			
	0.063	+/-0.010	.063	/			
	4.26	+/-0.030					
	R0.063	+/-0.010	.063	/			
	R0.50	+/-0.030					
SIDE B	2.240	+0.005/-0.000	2.240	/			
	2.180	+0.005/-0.000	2.185	/			
	2.180	+0.005/-0.000	2.185	/			
	2.208	+0.005/-0.000	2.213	/			
	2.234	+0.005/-0.000	2.238	/			
	2.253	+0.005/-0.000	2.255	/			
	2.272	+0.005/-0.000	2.277	/			
	2.299	+0.005/-0.000	2.299	/			
	0.063	+/-0.010	.063	/			
	4.26	+/-0.030					
	R0.063	+/-0.010	.063	/			
	R0.50	+/-0.030	.0				
	122.70	+/-0.060	122.70			tape	MM. L-82

Measured by: <i>MM. L-82</i>	Audited by: <i>[Signature]</i>	Preliminary Approval:
Date: 12/04/22	Date: 12-4-24	Date:

Rev	Date	Change	Revised by	Approved
A	07.01.17	New Issue (P/O D350-748-201)	KJ/JLM	
B	12.02.02	Dwg Rev updated	KJ	<i>[Signature]</i>

W/O:		WORK ORDER CHANGES					
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Item	Qty -241	Part Number	Description
1	X	D350-748-241	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6015-125	CROSSTUBE (OR D6018-125)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6018-125
FINISHED LENGTH = 122.700±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-241" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) RUN CUTTER OFF PART WHERE INDICATED. BLEND OUT ALL EDGES FROM MACHINING
LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER
BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 83642 MLC
12/04/20

RELEASED
2011-01-08
JWP

F	ADD HRC TEST OPTION (BB-1) PER PAR 08-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); ADD TOLERANCES (ZN C6-3, D2-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6018-125 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		

DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D350-748-241	REV. F SHEET 1 OF 4
TITLE CROSSTUBE (AS 350/355 HI AFT)	SCALE NTS
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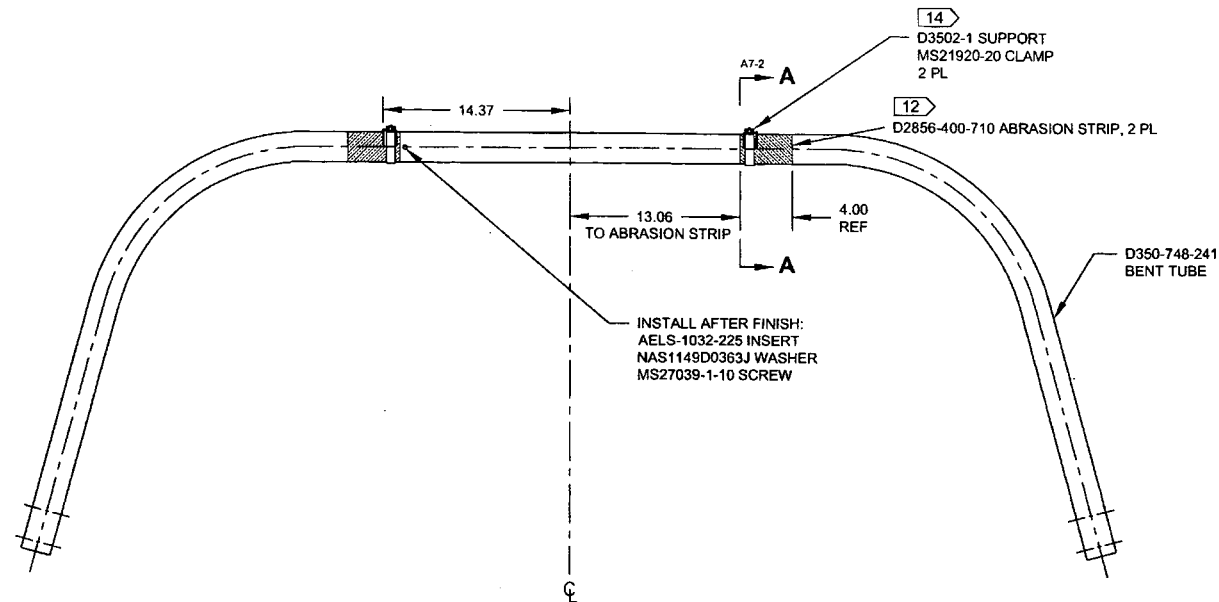
W/O:		WORK ORDER CHANGES					
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Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

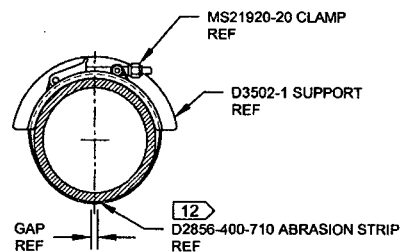
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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**D350-748-241
ASSEMBLY DETAIL**



**SECTION A-A D4-2
SCALE 4X**

RELEASED
2011-03-19
JMR

DESIGN	90	DART AEROSPACE LTD	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	B	DRAWING NO.	REV. F
MFG. APPR.	B	D350-748-241	SHEET 2 OF 4
APPROVED	H	TITLE	SCALE
DE APPR.	H	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD	
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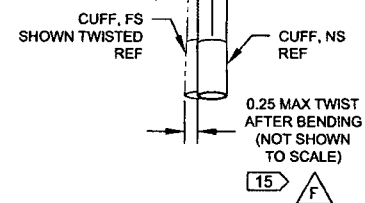
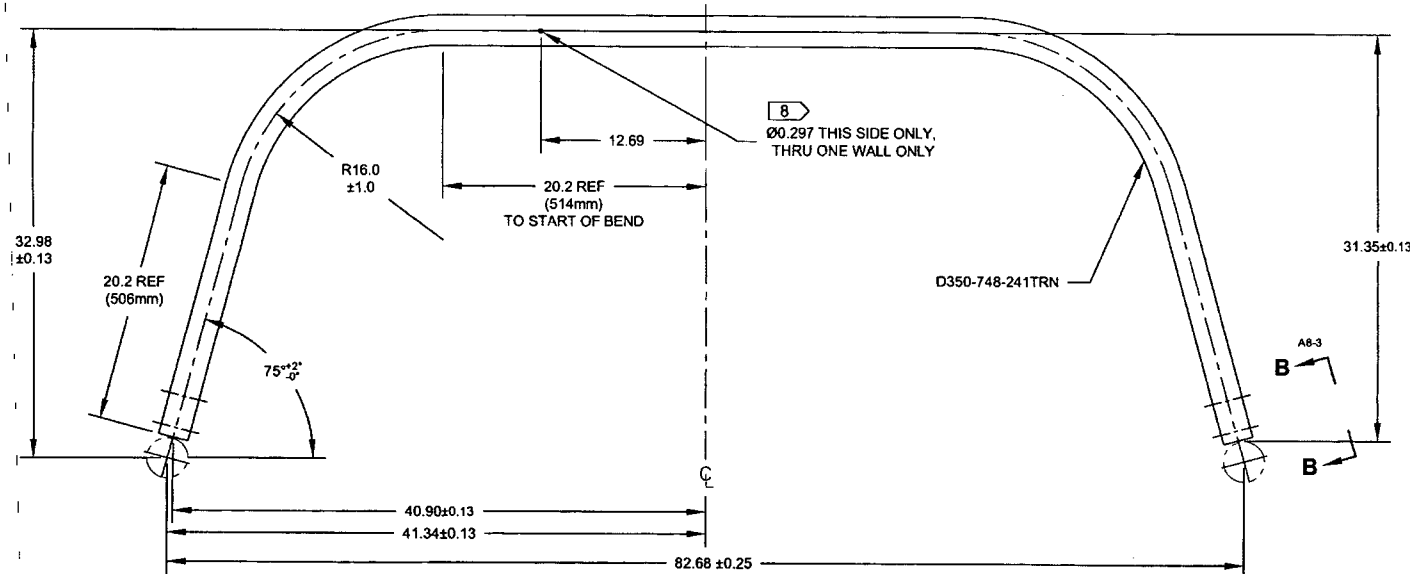
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

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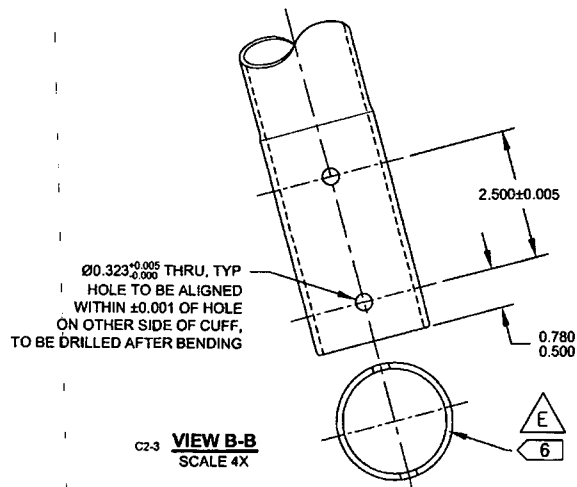
NOTE: Date & initial all entries

83642



D350-748-241
BENDING AND DRILLING DETAIL 10

RELEASED
2011-01-18



VIEW B-B
SCALE 4X

DESIGN		DART AEROSPACE LTD	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-241	SHEET 3 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI AFT)	NTS
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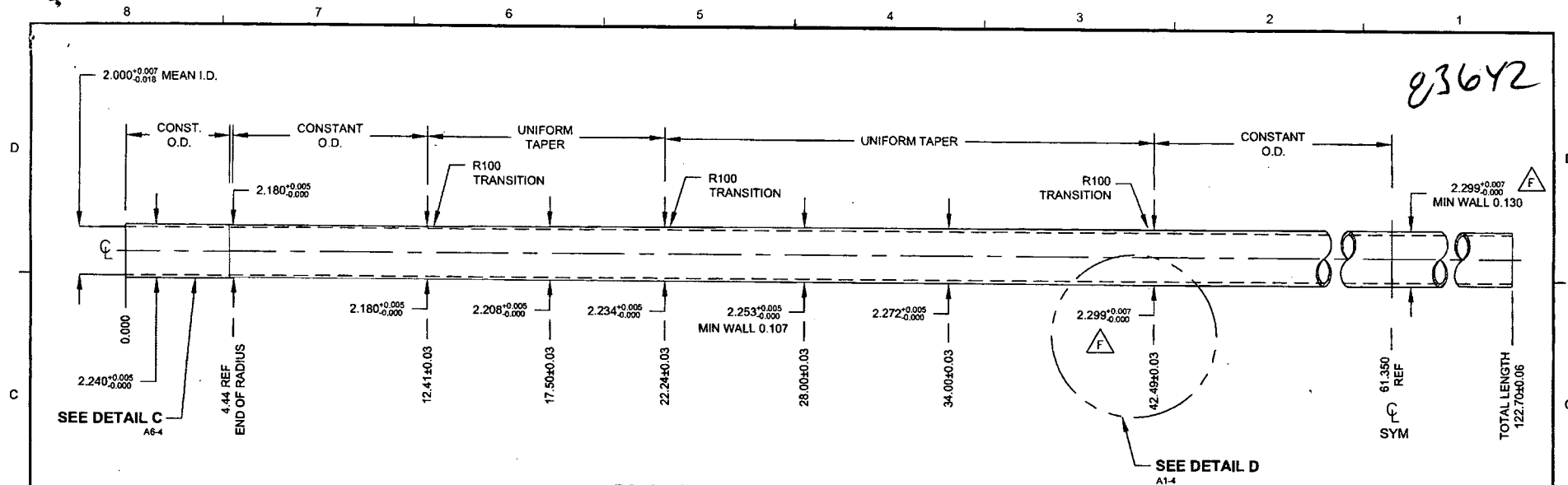
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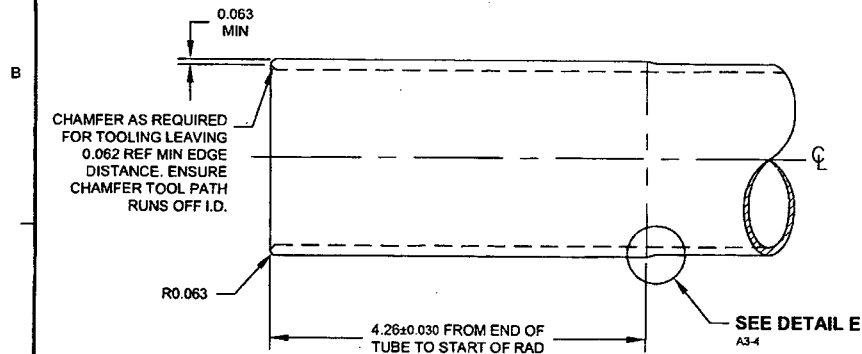
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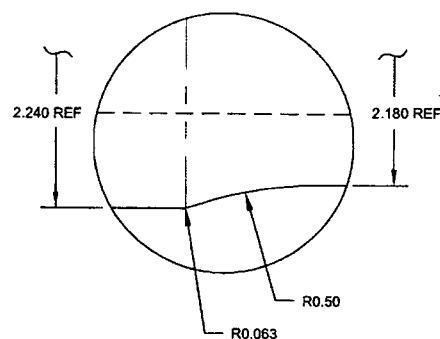


**D350-748-241TRN
TURNING DETAIL**

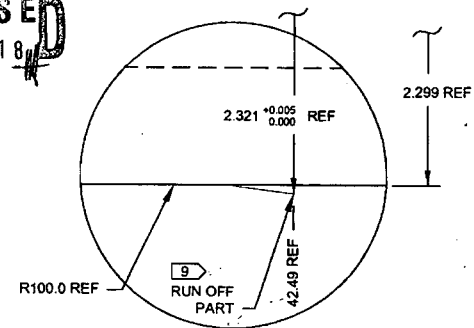
RELEASED
2011-01-18



**DETAIL C:
CROSSTUBE CUFF** C8-4
SCALE 3X



**DETAIL E:
CUFF TRANSITION** A5-4
NOT TO SCALE



**DETAIL D:
TAPER RUN-OFF** C3-4
NOT TO SCALE

DESIGN	9P	DART AEROSPACE LTD	
DRAWN	9P	HAWKESBURY, ONTARIO, CANADA	
CHECKED	9P	DRAWING NO.	REV. F
MFG. APPR.	9P	D350-748-241	SHEET 4 OF 4
APPROVED	9P	TITLE	SCALE
DE APPR.	9P	CROSSTUBE (AS 350/355 HI AFT)	NTS
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1000 E. Mermaid La., Wyndmoor (Phila.) PA 19038-8093
Tel. (215) 233-2600 Fax (215) 233-5653

Certification

SOLD TO

Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7

June 5, 2012

Metlab Shop Order No:	72197
Purchase Order:	16899
Description:	Crosstube
Part No.:	D350-748-141TRN, D350-748-241TRN
Quantity:	7 and 4 Pieces, Respectively
Weight:	500 Pounds
Material:	4130 Alloy Steel
Specifications:	Heat Treat to Minimum 180 KSI (MIL-T-6736OR AMS 2759-IC)
Note:	Need HRC 40 - 45

This is to certify that the above parts were processed as indicated above and conform to the specification requirements.

Results:

HRC 45 (218 KSI Tensile Strength, Converted)

METLAB

Quality Representative Mark Podob

MERCURY CONTAMINATION: During the heat treating process, testing and inspections, the product did not come in direct contact with mercury or any of its compounds nor with any mercury containing device.



Heat Treating and Metallurgical Consulting

Chris Provencal

From: David Shepherd <dshepherd@dartaero.com>
Sent: Monday, July 16, 2012 6:26 PM
To: 'Mike Petsche'; 'Chris Provencal'
Cc: Bill Beckett; Pat Smith; 'Linda Lacelle'
Subject: RE: NCR D212-664-201 & D350-748-201

Chris,

Looking at the photos, I think we should scrap both tubes.

David

From: Mike Petsche [<mailto:mpetsche@dartaero.com>]
Sent: July-16-12 1:59 PM
To: 'Chris Provencal'; 'David Shepherd'
Subject: RE: NCR D212-664-201 & D350-748-201

Honestly, they both look pretty sketchy. The wrinkles are pretty obvious

From: Chris Provencal [<mailto:cprovencal@dartaero.com>]
Sent: Monday, July 16, 2012 3:12 PM
To: David Shepherd
Cc: Mike Petsche
Subject: NCR D212-664-201 & D350-748-201

David, too NCRs:

D212-664-201

Two dings along the neutral axis, each near one of the supports. They are up to 0.010" deep . The dents are from shipping damage. Because the damage is from an unknown impact, I am inclined to scrap the tube.

REF. picture [_IM_2848.jpg](#)

D350-748-201

There is rippling on one bend. We used to get this all the time and have shipped out tubes with some rippling before. The tube is actually crushed less than normal, and is well within dwg tolerance, but the rippling makes it more noticeable.

I've been told to try to save every 350 I can, and I think this one is in line with what we would have accepted in the past. After paint, it's clear that you can see it visually as well as to touch. To me, this is more of a customer perception issue.

REF. picture [_IM_2849.jpg](#)